

## REMARKS

The invention as presently claimed is directed to the introduction of NaOH AP downstream of a primary, secondary and/or tertiary refiner in combination with applying NaOH AP pre-treatment to lignocellulosic material before refining. Preferably, the refiner has a highly pressurized case, for achieving the known benefits of high pressure refining.

As a result of the foregoing amendments, independent claim 1 with associated dependent claims 2-16, 44 and 45; independent claim 18 with associated dependent claims 19 and 20; independent claim 21 with associated dependent claims 22, 23, 28-34, 46 and 47; independent claim 36 with associated dependent claims 37, 38, 39, 48 and 49; and independent claim 42 with associated dependent claim 43, remain in the application. Independent claims 17 and 35 and dependent claims 24, 25, 26, 27, 40, and 41 have been cancelled. Claims 44-49 are new.

All independent claims have been amended to include the recitation that the alkaline in the alkaline peroxide solutions is sodium hydroxide, and most require that the post-refiner introduction of sodium hydroxide alkaline peroxide solution is in the blow line.

The use of sodium hydroxide as the alkaline portion of the alkaline peroxide solution is supported, for example, on page 29, beginning at line 15. Whereas the "intermediate line" was defined in the specification as extending between the refiner and the retention tower (page 7 line 11), the blow line is identified in Figure 11 with numeric identifier 30, and described on page 7, lines 14-17, as extending between the blow valve and the pulp separator.

On page 8, beginning at line 6, applicant expresses the preference that the introduction of the AP occur immediately after the blow valve, from a few inches to a few feet after the blow valve. This supports claims 20 and 21. Furthermore, on page 3, at line 10-18, applicant discusses the preferred embodiment wherein more than one third of total AP in the process, is introduced at or near the blow valve. This is especially effective in a high pressure TMP system. This supports new claims 44-49.

A distinguishing feature of independent claim 1, is that the primary pulp discharged from the refiner into the blow line has a temperature at least about 80°C, and even after the primary pulp is mixed with the blow line AP solution, the mixture retains a temperature of at least about 80° when discharged into the retention vessel at the end of the process. Independent claim 18 is somewhat similar, except it is distinguish by requiring that the primary refiner have a super atmospheric casing. Independent claim 21 is somewhat similar to independent claim 18, except for the recitation that the AP solution is added in the blow line at a point within about three feet of the flow valve, and without any specification as to the temperatures.

Independent claim 36 specifies a super atmospheric casing, but without limitation as to temperatures and, unlike the other independent claims, merely specifies that the post-refiner NaOH AP solution is introduced into the intermediate line.

Independent claim 42 does not specify a temperature or specific location in the intermediate line where the post-refiner NaOH AP solution is introduced, but does specify that this introduction operates on a material that was previously pretreated and impregnated with NaOH AP pretreatment solution and which was previously refined. Accordingly, this claim is directed to a second or third refining stage.

In the Final Official Action dated June 9, 2006, claims 1-11, 17-29, and 35-43 were rejected under 35 USC §103 on the basis of the disclosure of U.S. 4,486,267 (Prusas) in view of the disclosure of U.S. 6,743,332 (Haynes).

Claims 17, 24-27, 35, 40 and 41 have been cancelled, so the rejection thereof is moot.

Applicant emphasizes with respect to independent claim 1, 18, and 21, the recitation that the NaOH AP solution is introduce in the blow line, preferably within three feet of the blow valve which is the ideal location for thorough mixing of the AP solution with the pulp emerging from the refiner. As set forth on page 3 in the paragraph beginning on line 10, when a substantial fraction of the overall NaOH AP (at least one third) is applied at or near the blow valve in the post refiner intermediate line, in combination with the NaOH AP impregnation of the chips upstream of the refiner, and especially when NaOH AP is also introduced at the refiner, better energy efficiency and more efficient bleaching are achieved relative to the application of all the chemicals

before discharge from the refiner. By moving a greater number of chemical reaction downstream relative to conventional techniques, with the improve mixing at the blow valve or at least the blow line, the AP can perform its chemical bleaching with far less a degradation which would other wise occur with AP introduction at or upstream of the refiner in a high pressure refining system. Furthermore, at least some of the claims have been amended to recite a bleaching tower downstream of the intermediate line.

The effectiveness of the AP introduction at the blow line is very much dependent on the pretreatment steps recited in applicant's claims as mentioned in the previous paragraph. Thus, not only is there no disclosure in any one reference of NaOH AP pretreatment including pressing and impregnation upstream of the refiner, followed by NaOH AP addition downstream of the refiner, but furthermore, there is no basis among the references for one of ordinary skill to appreciate the particularly efficacious results arising from the combination of such pretreatment with such blow line addition. This is not an arbitrarily selected combination, in that applicant does not assert that introduction of NaOH AP at the refiner followed by NaOH AP in the blow line, without NaOH AP pretreatment, provides any of the special advantages of the claimed invention.

Example set C of applicant's specification shows that in a pressurized refiner system, NaOH AP pretreatment and NaOH AP in the blow line achieves similar bleaching efficiency as NaOH AP pretreatment with NaOH AP introduced at the refiner in an atmospheric refining system. The relevant data are shown in Figures 15-17. Figure 15 shows the results for two types of chips with the NaOH AP introduced either in the refiner eye or in the blow line, in a configuration wherein the refiner pressure is modestly above atmospheric. Figure 16 shows the results wherein the NaOH AP is introduced into the refiner, is at zero refiner pressure, whereas in the test where the NaOH AP is introduced into the blow line, the refiner casing pressure is modestly above atmospheric. Figure 17 compares the introduction of NaOH AP at the refiner eye at a substantially elevated refiner pressure, and introduction of the NaOH AP at the blow line, with the refiner pressure being more than double that of the test where the introduction was at the refiner eye. The 4.3 bar pressure shown in the "blow line" column of Figure 17 is the typical pressure found in modern high pressure TMP refining systems (i.e., above 60 psig).

Even independent claims 36 and 42 recite a patentable process, wherein the NaOH AP is introduced in the intermediate line where the temperature is lower than in a pressurized refiner. If high loading of AP is introduced in a pressurized refiner, the temperature would likely be well above a level that if sustained in the intermediate line, would have a detrimental effect on the pulp or else reduce the effectiveness of the carry-over AP. Thus, the discharge should be quenched, to maintain the temperature of the pulp/AP mixture at about 80 deg. C. With the broadest aspect of the current invention in which no AP is introduced in the refiner, less AP is present in the refiner (only carry-over from the AP pretreatment). Most of the AP is introduced in the post-refiner blow line or intermediate line, where the temperature will be well above 80 deg. C but the AP is not exposed to the much higher temperatures of the pressurized refiner. Thus, no quenching is needed. Even if in one of applicant's embodiments, some AP is introduced into the refiner as well as in the blow line, a heavier AP loading is at the blow line, where the deleterious effects of the high refiner temperature are not as severe.

Applicant acknowledges that Prusas discloses NaOH AP in a first pretreatment, but this is followed in Prusas by the steps of removing the alkaline liquor from the chips and then in a second pretreatment step, impregnating the chips with a sulfite liquor and cooking the chips in sulfite liquor. Only after the sulfite cooking, are the chips mechanically refined. There is absolutely no disclosure, teaching, or hint that any of the AP from the pretreatment, should desirably carry over into the refiner, or that any AP should be added at the refiner or after the refiner. The examiner has specifically acknowledged that Prusas does not teach refining at superatmospheric conditions, adding AP anywhere in the intermediate line (let alone the blowline), or retaining the pulp mixed with AP in the intermediate line, whereby bleaching can continue.

Because AP pretreatment is well known, the AP in Prusas is present only in the first pretreatment and then removed, and the focus of Prusas is on the second pretreatment of impregnating and cooking the chips with sulfite liquor, one of ordinary skill in this field would consider the AP in Prusas as merely incidental, or a prelude, without laying any foundation as a basic disclosure of a fundamental AP process.

Although Haynes discloses adding AP to the intermediate line while the primary pulp is above 80 deg. C, mixing, and discharging to a retention vessel, Haynes does not

disclose any AP pretreatment upstream of the refiner. Given that Prusas removes all AP after first stage pretreatment, but does not remove (merely drains, col. 6, ln. 65) the sulfite liquor on the chips through to and including refining, why would one have any reason to combine Haynes with Prusas for the purpose of introducing AP in pretreatment, skip the sulfite step, then add AP post refiner, and optionally at the refiner?

Moreover, Haynes uses an alkali that differs from NaOH (sodium hydroxide) but allegedly gives the same brightness as NaOH. This becomes critical because the Haynes process uses chemicals to give "...greater brightness, improved yield...lower oxalate, COD and BOD concentrations, than is capable with 100% alkalinity derived solely from the sodium hydroxide..." (column 8 lines 4-6). Haynes states that the advantages result when the alkalinity is not from NaOH.

This teaches directly away from applicant's invention as claimed, wherein the alkalinity of the AP solution is from NaOH. One skilled in the art would not try to combine Prusas (which uses NaOH in the first pretreatment) and Haynes (which disparages NaOH) together because Haynes actually replaces NaOH with Mg(OH)2. If Haynes were used in combination with Prusas the alkali would be Mg(OH)2 not NaOH (column 7, lines 44-45). Haynes is trying to overcome environmental issues that applicant's invention does not address. Column 9 *et seq.* in Haynes describes the environmental issues and how conventional processes using NaOH are avoided with his invention.

Notwithstanding the disclosure of Prusas in col. 7, ln. 11, there is no suggestion in Prusas, of a post-refining bleaching step wherein AP is introduced into the intermediate line. The examiner modifies Prusas with the Haynes reference, which shows AP introduction via line 262 (Figure 2) in the intermediate line between the refiner and the separating cyclone, followed by secondary refining and a bleaching retention tower. The examiner states that Haynes discloses that AP can also be introduced at the refiner. However, in every instance where the examiner alleges a teaching of AP in Haynes, that teaching points away from NaOH as the alkaline component.

In the two cited processes of Prusas and Haynes, each focuses on different parts of overall processes that are not compatible for combination or integration. In essence, these are alternative systems, with no disclosure or suggestion in either reference, that a benefit could be gained by grafting on the extensive further equipment and process steps that are disclosed in the other reference, as attempted by the examiner. In essence, Prusas takes the extra trouble of removing the AP before cooking the impregnated chips in sulfite liquor before refining, and therefore would not contemplate further bleaching using AP downstream of the refiner. Haynes provides no teaching or even hint of an AP pressing/impregnation pretreatment upstream of the first refiner.

Furthermore, Haynes is not really concerned with optimizing the locations of the AP introduction. Instead, Haynes basically teaches that, regardless of where a designer has determined to introduce AP, an alkali buffer rather than sodium hydroxide should be used. This is clear in the first sentence of the Summary of the Invention, and in independent claims 1, 38, and 41. None of these recites any particular location where the bleaching liquor is to be introduced in the refining system. In fact, none of the 41 claims of Haynes recites a step that defines where the bleaching liquor is introduced in the refiner system. This cannot teach one of ordinary skill how to modify Prusas, by eliminating the crucial sodium sulfite cooking step of Prusas and substituting NaOH AP introduction in the intermediate line.

Neither of these references provides a nexus to the other such that one of ordinary skill in the art would, without applicant's own specification, recognize the surprisingly good results that can be achieved by combining the NaOH AP pretreatment upstream of the refiner, with NaOH AP introduction in the blowline, especially in a system having a pressurize primary refiner.

For these reasons, Prusas and Haynes are not properly combinable, and the rejection of claims 1-11, 17-29, and 35-43 on this basis should be withdrawn.

Claims 12-16 and 30-34 were rejected under 35 U.S.C. §103 on the basis of Prusas and Haynes, further in view of the disclosures of three other patents or publications. These claims depend indirectly from one of the independent claims 1 or 21. At this time, applicant repeats the point that the fundamental basis for the rejection, the combination of Prusas and Haynes, is fatally flawed. Therefore, if the independent

claims 1 and 21 are patentable over the combination of Prusas and Haynes under 35 U.S.C. §103, claims that depend directly or indirectly from claims 1 or 21 are likewise patentable under 35 U.S.C. §103.

Applicant previously paid for seven independent and 43 total claims. Upon entry of the present amendment, five independent claims and a total of 41 claims are presented. Accordingly no fee for extra claims is required.

For the foregoing reasons, applicant believes all claims are in condition for allowance.

Respectfully submitted,

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